## **Spot Safety Project Evaluation**

Project Log # 200712090

Spot Safety Project # 07-98-226

Spot Safety Project Evaluation of the Eastbound Left Turn Lane and Traffic Signal Installation at the Intersection of SR 2182 (Horse Pen Creek Rd) and SR 2190 (Carlson Dairy Rd) Guilford County

Documents Prepared By:

Safety Evaluation Group Traffic Safety Systems Management Section Traffic Engineering and Safety Systems Branch North Carolina Department of Transportation

Principal Investigator							
Jason B. Schronce							
Traffic Safety Project Engineer							

# Spot Safety Project Evaluation Documentation

## **Subject Location**

Evaluation of Spot Safety Project Number 07-98-226 – Located at the Intersection of SR 2182 (Horse Pen Creek Rd) and SR 2190 (Carlson Dairy Rd) in Guilford County.

## Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an actuated traffic signal and an eastbound 150 foot left turn lane. In the before period, SR 2182 (Horse Pen Creek Road) and SR 2190 (Carlson Dairy Rd) were both two-lane facilities at the subject intersection with no turn lanes and speed limits of 35 mph. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 2190 (Carlson Dairy Rd). Within the same quarter of 2002 as these improvements were installed the Tuscany Residential Townhome Community was constructed to the east of this location which created a westbound right turn lane on SR 2182 (Horse Pen Rd).

The original statement of problem was the insufficient gaps in traffic which was creating left turn and rear-end crash patterns. The intersection met volume warrants 1, 9, and 11.

The initial crash analysis was completed from May 1, 1995 to April 30, 1998 with seven (7) reported crashes, five (5) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on September 15, 2002 with a total cost of \$150,000.

### **Naive Before and After Analysis**

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from August 1, 2002 to October 31, 2002. The before period consisted of reported crashes from September 1, 1997 through July 31, 2002 (4 years and 11 months); and the after period consisted of reported crashes from November 1, 2002 through September 30, 2007 (4 years and 11 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis completion.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.* 

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Eastbound Rear-End Crashes and Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	9	6	- 33.33 %
Total Severity Index	11.07	3.47	- 68.65 %
Target Crashes	6	4	- 33.33 %
Target Crash Severity Index	13.63	4.70	- 65.52 %
Volume	10,000	13,300	33.00 %
Injury Crash Summary - Total			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.00 %
Class B injury Crashes	0	1	100.00 %
Class C Injury Crashes	2	1	- 50.00 %
Total Injury Crashes	3	2	- 33.33 %

The naive before and after analysis at the treatment location resulted in a 33 percent decrease in Total Crashes, a 33 percent decrease in Target Crashes, and a 69 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2005.

### **Results and Discussion**

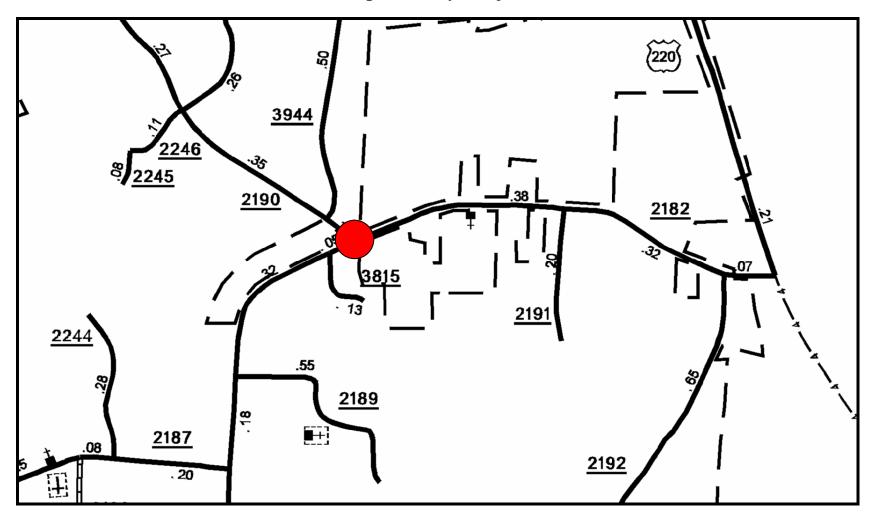
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 33 percent decrease in both Total Crashes and Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagram*, the installation of the eastbound SR 2182 left turn lane reduced the rear-end crashes from three (3) to one (1) by removing the queue from the through travel lane. Frontal Impact Crashes remained consistent at three (3) from the before to the after period although the type of crashes slightly varied. In the after period, two (2) vehicles ran the stop light and one (1) made an improper decision on gap acceptance from a permissive phase. No new crash patterns appeared to develop after the countermeasures were installed.

The calculated benefit to cost ratio for this project is 3.99 considering total crashes. The benefit to cost ratio considering only target crashes is 3.74. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

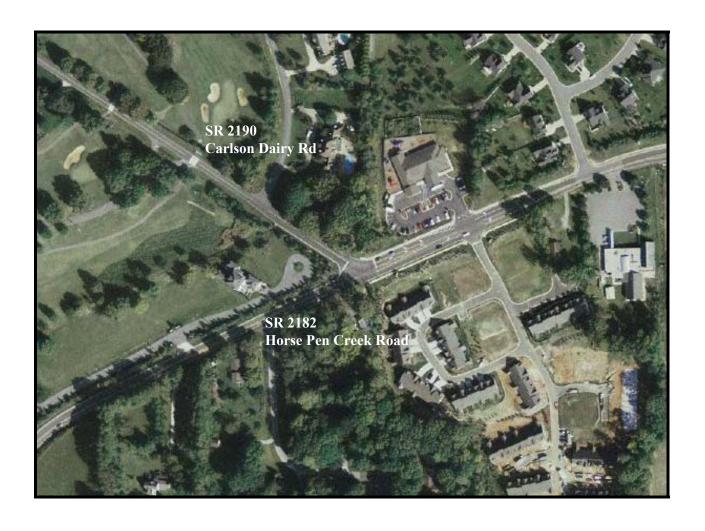
Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection as the after period changes were explained in the *Project Background* section. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map Guilford County, north of Greensboro Evaluation of Spot Safety Project # 07-98-226



Treatment Location: SR 2182 (Horse Pen Creek Road) at SR 2190 (Carlson Dairy Road)

# **SS# 07-98-26 Aerial Map**



# TREATMENT SITE PHOTOS TAKEN 5/6/2008



Traveling East on SR 2182 (Horse Pen Creek Rd)



Traveling West on SR 2182 (Horse Pen Creek Rd)



Traveling South on SR 2190 (Carlson Dairy Rd)



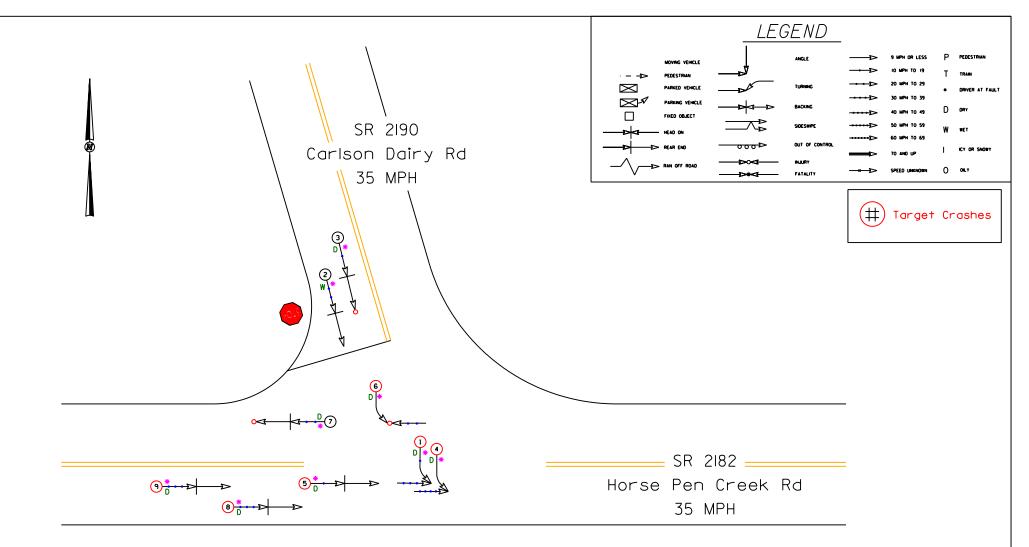
From SR 2190 (Carlson Dairy Rd) looking East towards subdivision

### BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: Horse Pen at Carlson Dairy COUNTY: Guilford FILE NO.: SS 07-98-226		BY: DATE: NOTES:	JBS 6/4/2008 Total Crashes					
DETAILED COST:	TYPE IMPROVEM	ENT -	Traffic Signal	. and EB Left	Turn Lane			
	ITEMS		TOTAL	SERVICE	CRF	ANNUAL COS	т	
	Construction Right-of-Way		\$150,000 \$0 \$0	10 0 0	0.149 0.000 0.000	\$22,354 \$0 \$0		
	TOTALS		\$150,000	10	0.149	\$22,354		
			UAL MAINT. COST			\$2,600 \$900		
	TOTAL ANNUAL TOTAL COST OF					\$25,854 \$150,000		
COMPREHENSIVE COST F	REDUCTION:							
		ESTIMATED N	UMBER OF ANNUAL	ACCIDENT DE	ECREASES			
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE AFTER	4.92 4.92	1 0	0.20 0.00	2 2	0.41 0.41	6 4	1.22	\$113,699 \$10,488
						Annual Benefi	ts from Crash Cost Savings	\$103,211
NET AVG. ANNUAL BENE	EFITS = AVG. ANNUAL	BENEFITS - T	OTAL ANNUAL COS	ST	=	\$77,357		
BENEFIT-COST RATIO =	- AVG ANNUAL BENEFIT	S/TOTAL ANNU	AL COST		=	3.99		
TOTAL	COST OF PROJECT	-	\$150,000		COMPREHENSI	VE B/C RATIO	- 3.99	

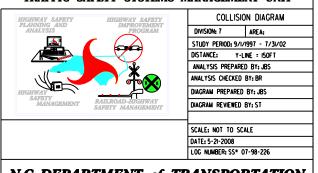
### BENEFIT-COST ANALYSIS WORKSHEET

				or Manib				
LOCATI	ION. Horse Pen at	Carlson Dairy	•	BY:	JBS			
LOCATION: Horse Pen at Carlson Dairy BY:								
	JNTY: Guilford			DATE:	6/4/2008			
FILE	NO.: SS 07-98-226			NOTES:	Target Crashes			
DETAILED COST:	TYPE IMPROVEM	ENT -	New Signal and	l EB Left Tur	rn Lanes			
	ITEMS		TOTAL	SERVICE	CRF	ANNUAL COST		
	Construction		\$150,000	10	0.149	\$22,354		
			\$0	0	0.000	\$0		
	Right-of-Way		\$0	0	0.000	\$0		
	TOTALS		\$150,000	10	0.149	\$22,354		
			JAL MAINT. COST			\$2,600 \$900		
	TOTAL ANNUAL					\$25,854		
	TOTAL ANNUAL TOTAL COST OF					\$150,000		
COMPREHENSIVE COST RE	DUCTION:							
		ESTIMATED NU	MBER OF ANNUAL	ACCIDENT DE	CREASES			
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE AFTER	4.92 4.92	1 0	0.20 0.00	0 2	0.00 0.41	5 2	1.02 0.41	\$105,589 \$8,902
						Annual Benefit	s from Crash Cost Savings	\$96,687
NET AVG. ANNUAL BENEF	ITS = AVG. ANNUAL	BENEFITS - TO	OTAL ANNUAL COS	ST	=	\$70,833		
BENEFIT-COST RATIO = 1	AVG ANNUAL BENEFIT	S/TOTAL ANNUA	AL COST		=	3.74		
TOTAL C	OST OF PROJECT	-	\$150,000		COMPREHENSIV	E B/C RATIO	- 3.74	

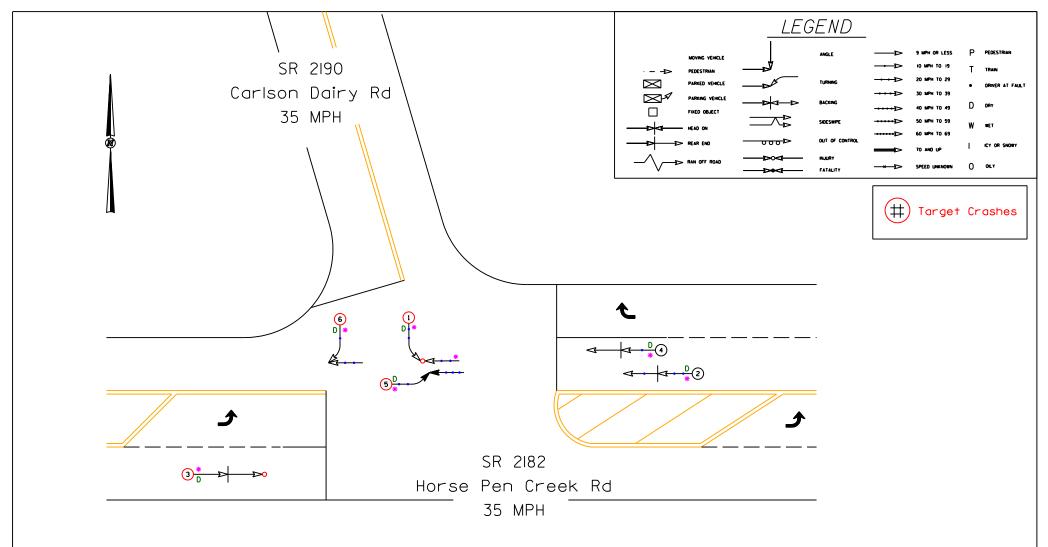


SS# 07-98-226
Guilford County
BEFORE Period
9/1/97 - 7/31/02
SR 2182 at SR 2190

### TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



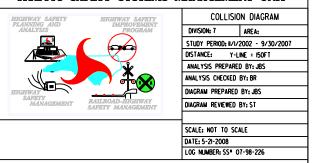
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH



SS# 07-98-226
Guilford County
 AFTER Period
 II/I/02 - 9/30/07
SR 2182 at SR 2190



#### TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH